QUALITY MANAGEMENT PLAN

FOR THE

CHESAPEAKE BAY PROGRAM OFFICE

U. S. ENVIRONMENTAL PROTECTION AGENCY—REGION 3
CHESAPEAKE BAY PROGRAM OFFICE
410 SEVERN AVENUE
ANNAPOLIS, MARYLAND 21403

Revision 4
OCTOBER 2010

CHESAPEAKE BAY PROGRAM OFFICE
QUALITY ASSURANCE MANAGEMENT PLAN

Concurrence

(1) Name: Richard Batiuk
Title: Quality Assurance Officer, Chesapeake Bay Program Office
Signature: _____ Date 10/8/2010

(2) Name: Carin Bisland
Title: Associate Director for Ecosystem Management
Signature: _____ Date 10/14/2010

(3) Name: Richard Batiuk
Title: Associate Director for Science
Signature: _____ Date 10/8/2010

Approval for Chesapeake Bay Program Office

(1) Name: James Edward
Title: Acting Director, Chesapeake Bay Program Office
Signature: _____ Date 10-15-2010

(2) Name: Robert Wood
Title: Acting Deputy Director, Chesapeake Bay Program Office
Signature: _____ Date 10-15-2010

Approval for U.S. EPA Region 3

Name: Terry Simpson
Title: Regional Quality Assurance Manager
Signature: _____ Date 12/10/2010

TABLE OF CONTENTS

List of Figures:

List of Attachments:

1 MANAGEMENT AND ORGANIZATION

1.1 QUALITY ASSURANCE POLICY STATEMENT

1.1.1 Introduction

The U. S. Environmental Protection Agency initiated the Chesapeake Bay Program in 1977. Under Title I, Section 117 of the Clean Water Act (CWA), Congress directed EPA to establish a research program capable of defining historical water quality conditions in Chesapeake Bay, characterizing current baseline conditions and developing computation and data management tools that would be used in future management of the Bay's water quality and living resources. The research program results revealed numerous weaknesses in earlier data collection efforts on the Bay and observed that there was a lack of comparable data sets for portions of the Bay and its tidal tributaries.

In 1983, the first of a series of formal, voluntary agreements among state and federal jurisdictions was signed – a simple, one-page document pledging the partners to work together to restore the Chesapeake Bay. In 1987 a second Chesapeake Bay Agreement was signed. Signatories to this Agreement formed the Chesapeake Executive Council, as directed by the 1987 Clean Water Act, to coordinate state and federal protection and restoration efforts. The Executive Council continues to develop new agreements and directives that prescribe specific goals, objectives and commitments for basin-wide restoration and protection actions.

The mission of the Chesapeake Bay Program Office is clearly defined under the Clean Water Act in § 117(b)(2), which requires that the EPA Administrator maintain the Chesapeake Bay Program Office within EPA, to be a member of and support the Chesapeake Executive Council through the following functions:

a. Implementing and coordinating science, research, modeling, support services, monitoring and data collection;

b. Developing and making available, information pertaining to the environmental quality and living resources of the ecosystem;

c. Assisting the signatories to the Chesapeake Bay Agreement in developing and implementing specific action plans to carry out their responsibilities;

d. Coordinating EPA actions with State and Federal actions to improve the water quality and living resources in the Chesapeake Bay ecosystem; and

e. Implementing outreach programs for public information, education and participation to foster stewardship of Bay resources.

Work to improve the water quality in the Chesapeake Bay watershed centers on the reduction of nitrogen, phosphorus and sediment pollutants which are largely responsible for the Bay's water quality and habitat impairments. These pollutants come from many sources, including sewage treatment plants, city streets, development sites, agricultural operations, and deposition from the air onto the waters of the Chesapeake Bay and the lands of the watershed.

1.1.2 Importance of Environmental Data

Many of the management decisions being made to accomplish the Chesapeake Bay restoration ultimately require the use of environmental data produced by EPA and/or by the federal, state, local and academic partners. The collection, compilation, evaluation and reporting of environmental data are necessary to carry out the mandated Chesapeake Bay Program Office functions listed above. It is necessary that the origin and quality of the data used to make these decisions is of known and documented quality so that the most beneficial, cost-effective actions may be taken.

1.1.3 Quality System Goals and Objectives

The Chesapeake Bay Program Office maintains a formal Quality Management System to ensure that all environmental data and related information products generated under its funding purview are of adequate quality to support immediate and future management decisions. The Quality System provides the necessary elements and procedures to plan, implement, document, and assess the quality of data and information products. Attachment 1 lists the major products and services covered by the Chesapeake Bay Program Office Quality System.

The Quality System ensures the integrity of the environmental data, i.e., the data must be scientifically valid, legally defensible, of known and documented quality and designed to meet data user requirements. The quality of the data is known when all components associated their derivation (methods, precision, bias, completeness, comparability, sensitivity, and representativeness) are documented. To achieve these objectives, quality assurance practices are incorporated into all phases of the environmental data collection, analysis and reporting activities, from

the planning stages, through implementation, assessment and ultimately dissemination of data products and services.

This Quality Management Plan satisfies Agency policy for environmental data collection set forth in EPA Order CIO 2105.0 (formerly 5360.1), which requires that EPA programs establish and implement a Quality Management System. It defines and describes the quality assurance policies and responsibilities prescribed by the Chesapeake Bay Program Office to ensure that the results of technical work are of the type and quality needed for their intended use.

This document also describes the objectives, organization, policies and work processes designed to produce data of known quality that guide Project Officers and Grant Managers in the uniform application of requirements to all grants, contracts, cooperative and interagency agreements involving environmental data.

1.1.4 Policy

It is the policy of the Chesapeake Bay Program Office that the Quality System will be appropriate to assure that all environmental data acquired, and where possible, processed or used by the Chesapeake Bay Program partnership, will be scientifically valid; of acceptable completeness, representativeness, and comparability; and of a known and documented quality. It is also the policy of the Chesapeake Bay Program Office that disseminated information will be presented in an accurate, clear, complete, and unbiased manner.

The quality of the data generated under the auspices of the Chesapeake Bay Program shall meet or exceed all State, Regional and National Program Office requirements. This policy shall be implemented by ensuring that for all environmental data related efforts, adequate quality assurance procedures will be employed throughout the entire environmental data collection process from study design through data access. The Chesapeake Bay Program Office will allocate sufficient funds to ensure that these policies are carried out.

1.2 ORGANIZATIONAL CHARTS

The Chesapeake Bay Program Office is organizationally located under the office of the Regional Administrator within EPA Region 3 (Figure 1).

Figure 1: CHESAPEAKE BAY PROGRAM OFFICE ORGANIZATION CHART

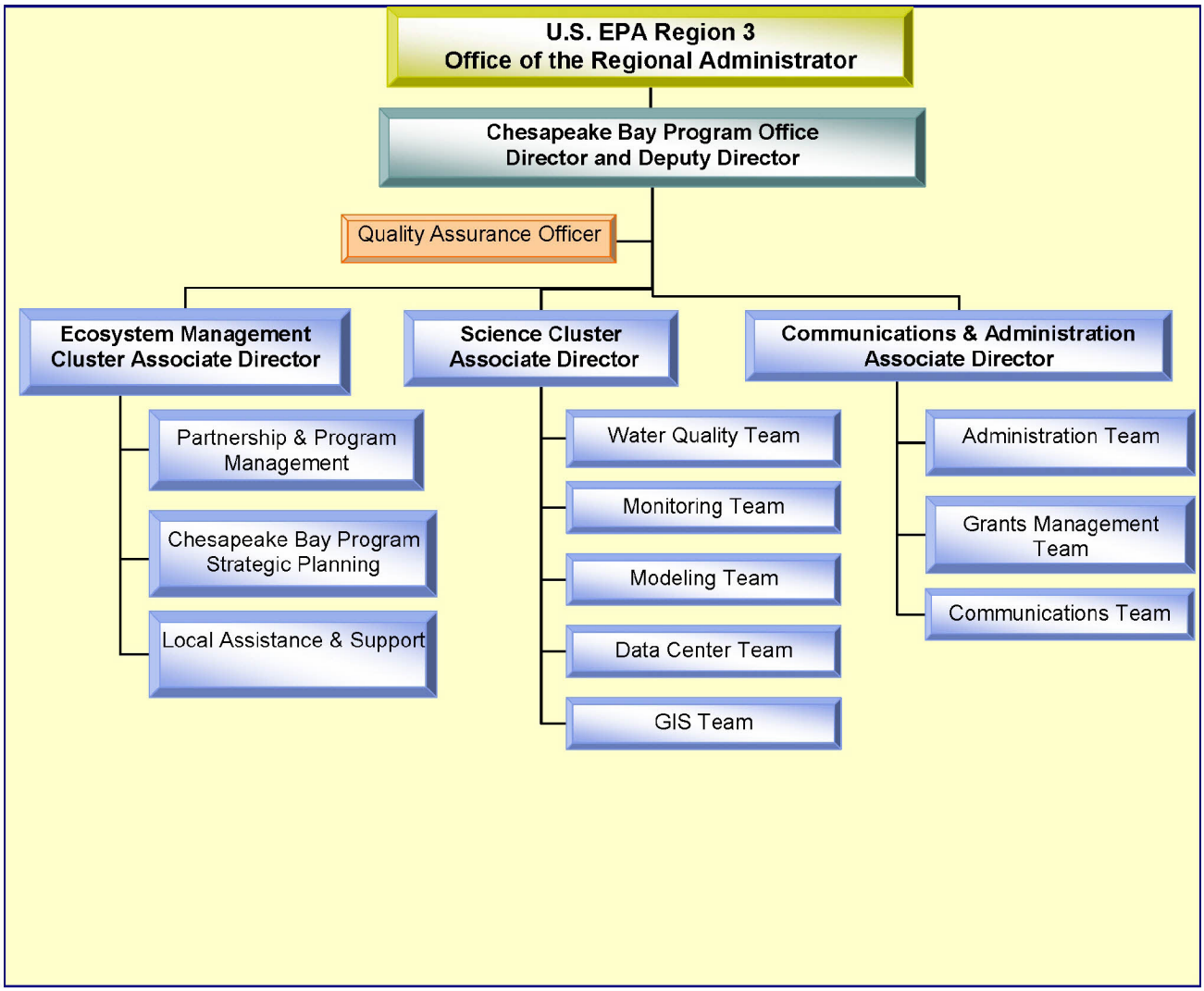
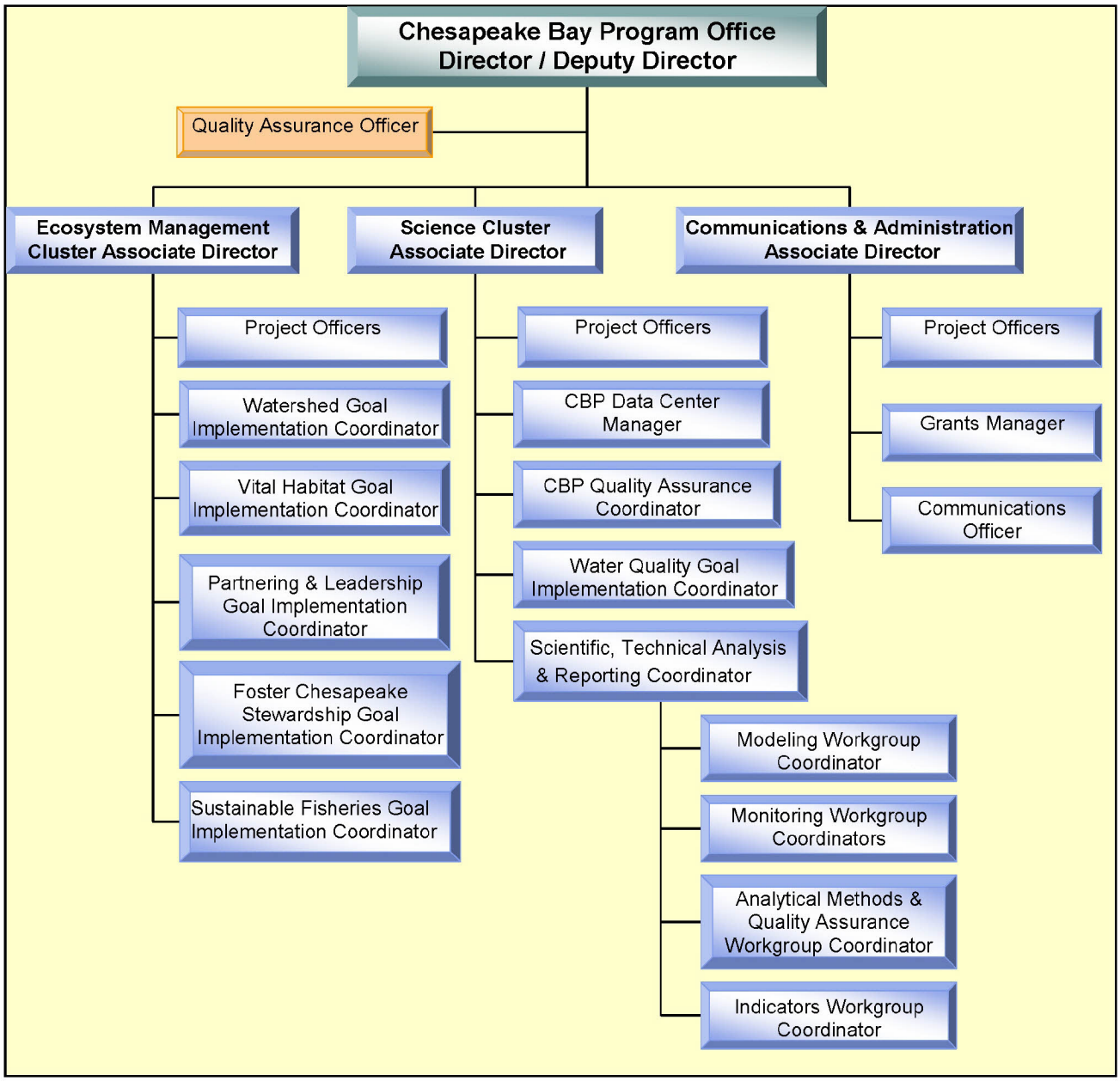


Figure 2: CHESAPEAKE BAY PROGRAM OFFICE ORGANIZATION AND LINE AUTHORITY IN TERMS OF MANAGERS, PROJECT OFFICERS AND GOAL IMPLEMENTATION TEAM COORDINATORS



1.3 RESPONSIBILITIES

1.3.1 Organization, Delegations and Responsibilities

The **Director of the Chesapeake Bay Program Office** has overall program management responsibilities for all restoration and protection activities including the acquisition of data of documented quality and management responsibilities for the development, implementation, and continued operation of the Chesapeake Bay Program Office Quality Assurance Program. Specific quality assurance management and implementation responsibilities are assigned to the Associate Director for Science, Project Officers, Coordinators for the Chesapeake Bay Program Goal Implementation Teams, the Chesapeake Bay Program Quality Assurance Coordinator and the Chesapeake Bay Program Data Center Manager.

The authority and responsibility for managing the quality assurance activities within the Chesapeake Bay Program Office has been delegated to the **Associate Director for Science** as the **Chesapeake Bay Program Office Quality Assurance Officer**. The Chesapeake Bay Program Office Quality Assurance Officer has the overall responsibility for the development, implementation and continued oversight of the Chesapeake Bay Program Office Quality Assurance Program. The Chesapeake Bay Program Quality Assurance Officer reports directly to the Director of the Chesapeake Bay Program Office and serves as the quality assurance liaison with the Regional Office.

The following list describes the responsibilities of the Chesapeake Bay Program Office Quality Assurance Officer:

- Serves as the official Chesapeake Bay Program Office contact for all quality assurance and quality control matters of the Chesapeake Bay Program Office;
- Coordinates Chesapeake Bay Program Office quality assurance matters with the Regional Quality Assurance Manager to insure that all methods, quality assurance policies are in accordance with National and Regional guidelines;
- Prepares the Chesapeake Bay Program Office Quality Management Plan;
- Reviews annually the Quality Management Plan and revises it if necessary;
- Oversees all quality assurance and quality control activities within the Chesapeake Bay Program Office;

- Identifies and delegates responsibility for responding to specific quality assurance and quality control needs, and ensures timely answers requests for guidance or assistance.

- Ensures all quality assurance program plans and quality assurance project plans are technically reviewed and approved prior to awarding grants, contract, cooperative agreements, and interagency agreements involving collection and/or analysis of environmental data;

- Ensures that problems and deficiencies identified in technical audits and data analysis are resolved;

- Includes specifications in the Chesapeake Bay Program grant, cooperative and interagency agreement guidance for quality assurance requirements; and

- Establishes criteria for the acceptability of quality documentation in Chesapeake Bay Program quality assurance reports.

Project Officers have the overall responsibility for ensuring that the recipients of federal funds implement the quality assurance activities required by EPA as stated in Chesapeake Bay Program Office grants, cooperative and interagency agreements guidance and documented with the individual assistance agreement. The Project Officers ensure all statements of work describe the intended use of environmental data to be collected so that specific guidance and criteria pertaining to the quality of the data can be given. Project Officers must obtain agreement from the Chesapeake Bay Program Office Quality Assurance Officer on all matters affecting quality assurance, but are ultimately responsible for resolving problems and deficiencies identified in technical reviews, audits and data analysis.

Chesapeake Bay Program Goal Implementation Team Coordinators are responsible for ensuring that requirements of the Quality Assurance Program are identified during Goal Implementation Team meetings and in activities sponsored by the Teams. The Coordinators ensure that quality assurance is an integral part of each environmental data collection activity sponsored by the Goal Implementation Team. Coordination of quality assurance activities among numerous partner state and federal agencies, academic institutions, and organizations is accomplished through the Team and/or its workgroups.

The **Chesapeake Bay Program Quality Assurance Coordinator** is responsible for coordinating quality assurance efforts among and between the Chesapeake Bay Program partners as they relate to environmental data collection efforts supporting Bay restoration and protection programs. The Chesapeake Bay Program Quality Assurance Coordinator reviews federal assistance agreements prior to award to determine if the proposed work has quality assurance requirements. Each determination is documented in a quality assurance review form and provided to the Project Officer, who notifies the recipient of the requirements and files the review form in the assistance agreement records. This procedure is repeated annually for multi-year awards.

The Quality Assurance Coordinator performs a technical review of the required Quality Assurance documents and makes recommendations on the adequacy of the plans to achieve the project objectives to the Project and Quality Assurance Officers, and as necessary, coordinates the resolution of deficiencies. S/he tracks the projects with Quality Assurance requirements by title, preparer and dates received, reviewed and approved.

The Quality Assurance Coordinator monitors the performance of environmental laboratories through inter-laboratory quality assurance samples. S/he participates in the technical assessment of the coordinated split sample results and the blind audit sample results and prepares or reviews summary and individual laboratory performance reports.

The Quality Assurance Coordinator performs quality assurance system audits--systematic on-site reviews of field and laboratory facilities, equipment, training, procedures, record-keeping, data validation, data management, and reporting aspects of the total quality assurance system--to insure that the approved quality assurance project plans, approved quality management plans, as well as approved sample handling and analytical procedures are in use. The Coordinator summarizes, substantiates and presents the audit findings to the Chesapeake Bay Program Office Quality Assurance Officer.

The roles and responsibilities of the Chesapeake Bay Program Office Quality Assurance Officer and the Chesapeake Bay Program Quality Assurance Coordinator are differentiated in *Attachment 2, Cross-walk of the Quality Assurance Responsibilities Held by Federal Employees within the EPA Chesapeake Bay Program Office.*

The **Chesapeake Bay Program Data Center Manager** has the program management responsibility for ensuring all the environmental data generated through the monitoring programs and projects funded directly by the EPA Chesapeake Bay Program Office or as matching funds have been subjected to an audit of data quality and will be documented as to known quality prior to being made accessible to Chesapeake Bay Program partners and the public through the Chesapeake Information Management System (CIMS). Additional responsibilities include:

- Ensuring security, stability and availability of the EPA and CIMS networks for the Annapolis office;
- Evaluating and implementing new technologies to address information technology needs and
- Implementing the Chesapeake Bay Program target enterprise architecture.

1.3.2 Communications

There are many forms of communication for ensuring quality assurance is integral to environmental collection efforts. Managers (Director and Associate Directors) of the Chesapeake Bay Program Office review the Quality Management Plan and concur by signing the document. Project Officers receive routine grants management training which includes the most recent requirements of the Quality System. These requirements are communicated to grantees and assistance agreement holders via the grant guidance, which is described in Section 7 below.

Once a submitted Quality Assurance Project Plan is approved, grantee reports are submitted quarterly or semi-annually and include any updates regarding the Plan's status. Further quality assurance and quality control documentation is required with the submission of data such as quality control sample results and metadata for the data themselves. Progress reports should include any changes to the quality assurance program plan or standard operating procedures; status of completion of outstanding quality assurance plans; significant quality problems, accomplishments, and status of corrective actions.

The Project Officer shall notify the Chesapeake Bay Program Office Quality Assurance Officer immediately of any problem areas identified. Necessary changes will be jointly outlined and the Project Officer will institute the corrective actions. A follow-up review of the required changes will be made by the Chesapeake Bay Program Office Quality Assurance Officer and the Project Officer to verify that problems have been corrected.

The Chesapeake Bay Program website is used to communicate Quality Assurance Program aspects to the public and to describe activities of the Analytical Methods and Quality Assurance Workgroup. These websites contain information pertaining to quality assurance policies, guidance documents, meeting materials, consensus standards, decisions, etc.

1.4 RESOURCES FOR THE QUALITY ASSURANCE PROGRAM

Responsibilities for implementation of the Chesapeake Bay Program Office Quality Assurance Program are distributed across a wide array of project officers, Goal Implementation Team Coordinators, Workgroup Coordinators, the Data Center Manager and others beyond the Quality Assurance Officer. Without a dedicated EPA FTE, the Associate Director for Science performs the duties of the Chesapeake Bay Program Office Quality Assurance Officer. The Chesapeake Bay Program Office funds a full time Quality Assurance Coordinator through an interagency agreement with the U.S. Geological Survey.

2 QUALITY SYSTEM AND DESCRIPTION

The goal of the Chesapeake Bay Program Office's Quality Management System is to ensure that each EPA-funded project involving the acquisition of new environmental data includes sufficient up-front planning for the development of well defined project goals and data quality objectives. These objectives need to be supported by implementation of sufficient sampling design, collection, and analytical protocols such that the resultant data completely and accurately addresses the project's goals. In order for the data to be useful to efforts to restore and protect the Chesapeake Bay, the data must be of known and documented quality, having sufficient supporting documentation such that subsequent data users can evaluate if the data meets their data needs.

2.1 DESCRIPTION

It is the policy of the Chesapeake Bay Program Office that:

- This Quality Management Plan is implemented as described herein and reviewed annually to ensure that it continues to accurately describe the organization and quality management policies of the Chesapeake Bay Program Office.

- Each agency receiving Chesapeake Bay Program Office grant or cooperative agreement funds for environmental data operations must maintain an approved Quality Management Plan or its equivalent that conforms to the document *EPA QA/R-2, Requirements for Quality Management Plans*.

- Each major project or program funded by the Chesapeake Bay Program Office which generates or uses environmental data will develop and implement a Quality Assurance Project Plan addressing the required major elements and will ensure that adequate resources (both monetary and staff) are provided to support the quality assurance effort. Quality Assurance Project Plans will specify the detailed procedures required to assure quality data and satisfy the requirements of the document *EPA QA/R5, Requirements for Quality Assurance Project Plans* and all applicable Chesapeake Bay Program objectives and protocols.

- Quality Assurance Project Plans must be jointly approved by the Chesapeake Bay Program Quality Assurance Officer and the Project Officer prior to environmental data collection. Special exemptions can only be requested and approved through the Chesapeake Bay Program Office Quality Assurance Officer.

- All environmental data generated for the Chesapeake Bay Program partnership through direct Chesapeake Bay Program Office funding or matching funding will be of known and acceptable quality as defined in the data quality objectives. The data quality information developed for all environmental data will be documented and made electronically available along with the data themselves.

- The intended use(s) of the data will be defined before the data collection or analysis effort begins, so that appropriate quality assurance measures may be applied to ensure a level of data quality commensurate with the monitoring objectives. The determination of this level of data quality shall also consider the prospective data needs of secondary users.

- Data quality objectives will be established to ensure the utility of the environmental data for its intended use and as guidance for preparation of Quality Assurance Project Plans. The intended data uses, level of quality, specific quality assurance activities, and data acceptance criteria needed to meet the data quality needs of these uses will be described in each environmental data collection activity's Quality Assurance Project Plan.

- Quality assurance activities will be designed in the most cost-effective fashion possible without compromising data quality objectives.

As the Chesapeake Bay Program partners continue to work to minimize the redundancy of monitoring efforts in the Bay while maximizing the amount of quality environmental data made accessible through the expanding set of information network exchanges, the Chesapeake Bay Program partners need to use data generated through

other Regional grants. Under the auspices of the Regional Quality Management Plan, Chesapeake Bay Program Office staff will work through the appropriate Program Offices of Region 3 to inform them of the quality assurance requirements of the Chesapeake Bay Program for inclusion in their grant requirements as is appropriate.

2.2 PRINCIPAL COMPONENTS OF THE QUALITY SYSTEM

There are several base and enhanced components to the Chesapeake Bay Program Office Quality Management System to carry out these policies. The base program consists of the development and maintenance of Quality Management Plans, Data Quality Objectives, Quality Assurance Project Plans, and the Chesapeake Information Management System. Management and staff roles and responsibilities related to these components are described above on pages 6-10.

There are a number of additional components to the Quality System. The Chesapeake Bay Program's Analytical Methods and Quality Assurance Workgroup (AMQAW) advises the Chesapeake Bay Program's Tidal and Nontidal Water Quality Workgroups on field and analytical methodology and quality assurance issues. AMQAW is responsible for the Chesapeake Bay Program's Coordinated Split Sample Program (CSSP), which ensures that data from the different laboratories are comparable, and for the maintenance of program-wide Methods Manual. The Data Analysis Issues Tracking System (DAITS) is used to identify, investigate, resolve and document data anomalies that may affect the interpretation of the data. The Chesapeake Bay Program Office's Data Center Team is charged with developing data/information management and submission policies and guidelines.

2.2.1 Data Quality Objectives

Data quality objectives are statements of the quality of environmental data required to support Program decisions or actions. Prior to initiating or significantly changing long-term, multi-jurisdictional monitoring programs, the Chesapeake Bay Program establishes data quality objectives through a formally structured process where it is determined which environmental data are needed, what data quality is required and what is the appropriate balance between time, resources and data quality.

2.2.2 Quality Assurance Project Plans

All directly Chesapeake Bay Program funded and in-kind match projects which involve the collection of new environmental data (activities that involve the measurement, monitoring or collection of physical, chemical, or biological data)

are required to document all aspects of their project's sampling design, sample collection, analysis, quality control, and data management activities in a quality assurance project plan. Within the Chesapeake Bay Program, these projects include the collection of groundwater, surface water quality, sediment, atmospheric, living resource, and remotely sensed data as well as the collection of environmental data to assess the efficiency of implemented management practices or control technology upgrades.

A quality assurance project plan is a formal document describing the methods for collecting and assessing environmental data, quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. The plan also describes any limitations on the use of the data that will be generated.

The quality assurance project plan is submitted to the Project Officer along with the draft grant or assistance application or listed as a deliverable to be received at least 30 days prior to the initiation of each data collection or data compilation activity. Each of the extramural organizations' Quality Assurance Project Plan must be reviewed and approved by EPA prior to the initiation of each data collection or data compilation activity. The requirements for quality assurance project plans are defined in QA/R-5: *EPA Requirements for Quality Assurance Project Plans* (EPA 2001).

For ongoing environmental data collection programs, quality assurance project plans must be updated annually to document any procedural changes to field, sample handling and storage, laboratory analysis, quality control and data management activities. The funding recipient must notify the Project Officer prior to changing the number of samples collected, the number of sites, methodologies or parameters tested. If no changes are required to an existing quality assurance project plan, the funding recipient is required to provide written documentation (e.g., a letter) to the Project Officer that a review was conducted and no changes have occurred.

All efforts must be made to produce data that is comparable to data collected previously and currently by other Chesapeake Bay Program grant recipients and partners. The funding recipient shall ensure the agencies, academic institutions, and/or consulting firms responsible for field sample collection and/or laboratory analysis of environmental samples collected using Chesapeake Bay Program funds or match funds will participate in the Chesapeake Bay Program Coordinated Split Sample and Blind Audit Program.

2.2.3 Quality Management Plans

In accordance with 40 CFR 30.54 and 31.45, organizations conducting environmental programs funded by EPA that acquire, generate, compile, or use environmental data and technology are required to establish and implement a quality system. Recipients of ongoing contracts, grants or cooperative agreements shall describe their quality system in a written Quality Management Plan. Quality Management Plans must be prepared in accordance with *EPA QA/R-2: EPA Requirements for Quality Management Plans* and be submitted for review and approval to the U.S. EPA Region 3 Quality Assurance Manager. Prior to the initiation of environmental data collection and/or compilation activities, each of the extramural organization's Quality Management Plan must be reviewed and approved. The Chesapeake Bay Program Office Quality Assurance Officer may approve combined Quality Management and Quality Assurance Project Plans.

Quality Management Plans are not required from federal agencies outside of EPA; however, it is the policy of the Chesapeake Bay Program Office that all federal interagency agreements fulfill all QA Project Plan requirements.

2.2.4 Standard Operating Procedures

Quality Assurance Project Plans submitted under grants and cooperative agreements may include Standard Operating Procedures (SOPs) to describe detailed sample collection and laboratory procedures. The SOPs are incorporated by reference and are submitted, reviewed and approved at the same time as the corresponding Quality Assurance Project Plan.

The Chesapeake Bay Program Office maintains internal SOPs for the management of monitoring data submitted to the Chesapeake Information Management System. Monitoring data are checked, compiled and uploaded into their respective databases according to data management SOPs. These SOPs are written by personnel performing the routine data management tasks and reflect actual data processing practices. Chesapeake Bay Program Office SOPs are prepared in document control format and are submitted to the Chesapeake Bay Program Office Quality Assurance Officer for approval and maintenance in a permanent file. Where applicable, the SOP is also kept in the grant file under which the data manager is funded. A listing of current SOPs follows.

Chesapeake Bay Program Data Management SOPs

(1) *Standard Operating Procedures for Managing Water Quality Monitoring Data,* Chesapeake Bay Program, Revision 3, May 2007.

(2) *Standard Operating Procedures for Managing Non-Point Source Data,* Chesapeake Bay Program, June 2002. Amended June 2009.

(3) *Standard Operating Procedures for Managing Point Source Data* Chesapeake Bay Program, Revision 1, November 2006.

(4) *Standard Operating Procedures for Conducting Geographic Information System (GIS) Projects,* Chesapeake Bay Program, July 2007.

(5) *Standard Operating Procedures for Managing Living Resource Monitoring Data at the Chesapeake Bay Program, Revision 2,* June 2010.

2.2.5 Chesapeake Information Management System

The Chesapeake Information Management System (CIMS) is an organized, distributed system of information and software tools designed for the purposes of management, decision making, and communicating Chesapeake Bay information. Internet sites in CIMS are maintained by CIMS partners, who are those states, federal agencies, academic institutions, and participating advisory groups and commissions who have signed a Memorandum of Agreement providing public access to its Chesapeake Bay watershed information.

With continued implementation of the Chesapeake Information Management System, the data generators are responsible for building in mechanisms for auditing data quality prior to making their data accessible to users via the Internet. Standardized procedures for auditing data quality are developed and adapted for the Chesapeake Bay Program partners' use.

2.2.6 Audits and Assessments

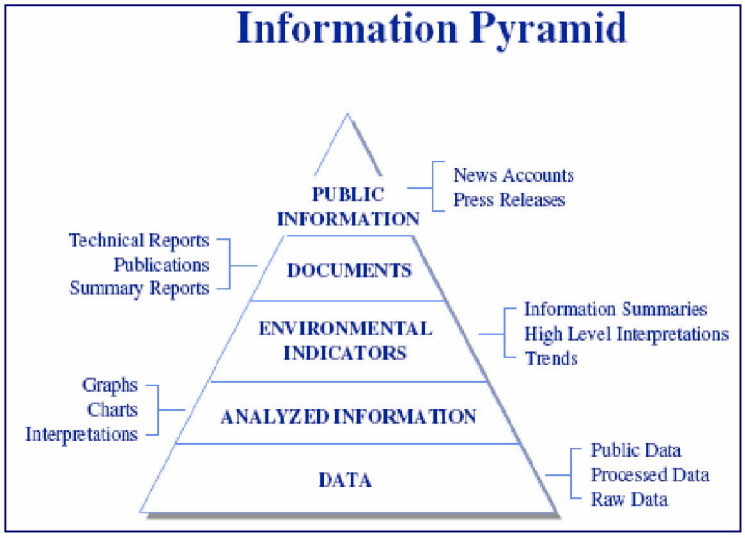
Technical assessments of long-term monitoring activities are conducted to confirm that grantee Quality Assurance Project Plans are being implemented. Each quarter, laboratory proficiency sample results are reviewed by the Quality Assurance Coordinator and if necessary, corrective actions are initiated. Proficiency sample results are summarized and reported annually to the major laboratories.

Independent assessments of quality control operations are periodically performed to ensure that grantees are meeting data quality objectives. The Quality Assurance Coordinator conducts on-site technical audits when unsatisfactory proficiency or quality control sample results are received. Further details are described in Section 9 below. For new monitoring programs, readiness reviews are done to assess grantee capability to carry out field, laboratory and/or data management activities.

Internal audits and self-assessments of grant files are routinely conducted by the Chesapeake Bay Program Grants Manager to ensure that quality assurance requirements have been met and documented in the grant files.

2.2.7 Pre-Dissemination Review of External Documents

The Chesapeake Bay Program Office ensures the quality of publically-released data and information products at each level of the Chesapeake Bay Information Pyramid (shown below). The quality of the stored data, analyzed information and environmental indicators is well documented so that reports, websites and publications based on that information are credible and transparent. Attachment 6, Chesapeake Bay Program Indicator Framework Indicator Survey, contains the pre-dissemination review requirements for environmental indicators.



2.3 PRODUCTS AND SERVICES SUPPORTED BY THE QUALITY SYSTEM

There are numerous environmental monitoring and modeling programs supported and/or influenced by the Chesapeake Bay Program Office Quality System. These programs are summarized below and listed in Attachment 1, Chesapeake Bay Program Office Organizational Products and Services Covered by the Office's Quality System. Attachment 1 includes major publications and information products that rely on these quality-assured data sources.

2.3.1 Long-term Monitoring Programs

The Quality System supports major, long-term monitoring programs and networks that produce a substantial amount of environmental data which are compiled and maintained in centralized databases. The data are used for a variety of products and services such as: calculating compliance with the jurisdictions' Chesapeake Bay water quality standards; supporting Clean Water Act §303 (d) listings, evaluating trends; estimating nutrient and sediment loadings; creating environmental indicators; calibrating environmental models; developing regulatory pollution budgets (TMDLs); and targeting expenditures of resources towards pollution sources and/or geographies for the most environmental benefit at the least cost. The major monitoring programs supported by the Chesapeake Bay Program Office and its Quality System are:

- Chesapeake Bay Mainstem & Tidal Tributary Water Quality Monitoring Program;
- Chesapeake Bay Watershed Surface Water Quality and Stream Flow Monitoring Network;
- Chesapeake Bay Watershed Biological Monitoring Network;
- Shallow-Water Monitoring Program;
- Benthic Invertebrate Monitoring Program; and
- Submerged Aquatic Vegetation Aerial Survey.

2.3.2 Modeling

The Quality System covers the environmental models and related decision making support tools developed and used by the Chesapeake Bay Program partnership. The quality and transparency of each model component is assured at various stages of development. Input data must be of known quality; model codes are tested and documented in permanent records; models are calibrated and the output verified. All modeling activities, assumptions and management applications are subject to scientific, independent external peer reviews. Examples of Chesapeake Bay

Program model protocols and assessments are contained in the following documents:

- Chesapeake Bay Watershed Model Phase V Review (STAC 2008);
- Chesapeake Bay Watershed Model Phase V Scenario Builder Application;
- State Quality Assurance Project Plans for compiling and reporting nutrient and sediment source (BMP) data;
- Review of the Phase 5 Watershed Model hydrologic calibration; and
- Chesapeake Bay Estuary Model Calibration and Application to Water Quality Criteria.

Additional information about Chesapeake Bay Program modeling, publications and projects may be found on the Chesapeake Bay Program Modeling Team website.

2.3.3 Environmental Indicators and Information

Environmental indicators are increasingly being used by program managers to summarize pollution sources and restoration actions and relate them to changes in environmental measures. Assessments using Chesapeake Bay Program health and restoration indicators are incorporated into scientific and management publications, websites and accountability tracking systems. The quality and sources of data for each indicator is reviewed, documented and approved prior to being used in the Bay Barometer and Chesapeake Stat. Procedures for a multi-jurisdictional database called Bay Tracking and Accountability System (formerly called "Activity Integration Plan") are currently under revision. Examples of quality assurance protocols for the environmental indicators and tracking systems follow:

- Quality Assurance Activities for the Chesapeake Action Plan. (Appendix F in July 2008 Report to Congress)
- Reporting Guidance for the CAP Application Reporting System – Version 1.0
- Annual Assessment of Chesapeake Bay Health and Restoration (Indicators)
- Attachment 4: Chesapeake Bay Program Indicator Framework: Indicator and Data Survey

3 PERSONNEL QUALIFICATION AND TRAINING

EPA and other Chesapeake Bay Program participants have received training in the context of tasks and functions related to data quality for the Chesapeake Bay Program. In addition, they are required to draw upon their educational background, experience, professional symposia, and on-the-job training. Staff participates in technical workshops to share and expand their knowledge in their areas of expertise. Staff proficiency is demonstrated through workshop presentations, written reports, committee presentations and Chesapeake Bay Program publications. The Chesapeake Bay Program Quality Assurance Coordinator has completed the following EPA Quality Assurance Training Classes:

1. Orientation to Quality Assurance Management
2. Data Quality Objectives
3. Preparing Quality Assurance Project Plans
4. Reviewing Quality Assurance Project Plans
5. Sampling Design
6. Environmental Data Verification and Validation
7. Laboratory Quality Systems

Project Officers receive formal instruction from the Agency every three years to explain their legal assistance agreement oversight responsibilities. Project Officers who intend to approve Quality Assurance Project Plans must complete courses 1, 2, and 4 listed above and must be authorized to do so by the Chesapeake Bay Program Office Quality Assurance Officer, who will document the completion of the required training.

4 FINANCIAL ASSISTANCE

4.1 COMPETITIVE FUNDING PROCESS FOR GRANTS AND COOPERATIVE AGREEMENTS

Most of the environmental monitoring data acquired and used by the Chesapeake Bay Program Office are derived from approved grants and cooperative agreements. Interagency agreements may fund environmental data operations; however, these agreements are not competitively awarded. Contracts are seldom used for environmental data acquisition.

Guidance for grant and cooperative agreement applications is developed as a collaborate effort among project officers in the Chesapeake Bay Program Office, with input from the jurisdictional Chesapeake Bay Program partners. The *Chesapeake Bay Program Grant and Cooperative Agreement Guidance* cites the quality assurance requirements for EPA grants and cooperative agreements that are mandated in 40 CFR

Part 30.54 for universities and non-profits and Part 31.45 for states, tribal and local governments. The guidance states that recipients of grants and cooperative agreements that fund environmental data operations shall submit a Quality Management Plan (QMP) and a Quality Assurance Project Plan prepared in accordance to the specifications in *EPA Requirements for Quality Management Plans, EPA QA/R-2* and *EPA Requirements for Quality Assurance Project Plans, QA/R-5*.

The *Chesapeake Bay Program Grant and Cooperative Agreement Guidance* is reviewed, updated and distributed annually to existing and potential future recipients of Chesapeake Bay Program Office funding. The guidance is also made available through the Chesapeake Bay Program website. Requirements for quality assurance and data deliverables are communicated to grant and cooperative agreement recipients through the Requests for Proposals, the grant guidance document and final award terms and conditions.

The Chesapeake Bay Program may use data which are generated under the auspices of other EPA, federal, state, local, and non-governmental organization funding mechanisms. For data beyond the direct control or influence of the decision makers and users within the Chesapeake Bay Program Office, Chesapeake Bay Program Office staff actively works with Region 3 programs and with other funding partners to develop consistent guidance materials and Quality Assurance Project Plans.

4.2 REVIEW AND APPROVAL OF RESPONSES TO REQUEST FOR PROPOSAL ANNOUNCEMENTS

The Chesapeake Bay Program Office has a system in place to review and approve proposals for grants and cooperative agreements. The process is initiated through extensive advertisement of a Request for Proposals (RFPs)/qualifications through website postings, hard copy and e-mail mailings using a RFP mailing list. Once proposals are received, they are initially screened by the Chesapeake Bay Program Office administrative team for deadline requirements, necessary applicant designations (e.g. nonprofit status), and other requirements specified by the RFP. After initial screening, eligible proposals are sent to a panel of three to five reviewers who rate each proposal on a predetermined set of criteria which is addressed within the RFP. The ratings for each proposal and the review team's recommendation are sent to the Office Director for a final selection of the grant or cooperative agreement recipient(s).

4.3 REVIEW AND APPROVAL OF GRANT AND COOPERATIVE AGREEMENT APPLICATIONS / AWARDS

Following the selection of the recipient(s) and proposal to be funded, the

applicant(s) is required to submit a formal grant application. The application then goes through extensive administrative and technical reviews. Once the final award document is signed, work can begin on the project, however, the recipient must have an approved Quality Management Plan and Quality Assurance Project Plan before environmental data collection or compilation work begins.

Post-award oversight by the Chesapeake Bay Program Office is mandated through the Chesapeake Bay Program Office Post-Award Monitoring Plan for Grants and Cooperative Agreements. This document describes in detail the duties of the Project Officer and supporting Chesapeake Bay Program Grants Management Team such as:

- Comprehensive tracking of administrative and technical elements of assistance agreements;
- Communication between recipients and the Grants and Audit Management Branch;
- Documentation of files;
- Monitoring of a recipient's compliance with the Statement of Work, Assistance Agreement Terms and Conditions and Budget Expenditures;
- On-site, mid-year (or six-month) closeout requirements;
- Certification of the receipt of final deliverables; and
- Attendance at periodic Project Officer meetings and scheduled training.

The Post-Award Monitoring Plan also addresses:

- Functions of the Chesapeake Bay Program Office Grant Special Task Team; and
- Duties of the Designated Liaison with Grants and Audit Management Branch.

The CBPO Grants Manager provides training to and periodically audits the Project Officer files to ensure that they contain the required information.

4.4 REVIEW AND APPROVAL OF QUALITY ASSURANCE PROJECT PLANS

All environmental data collection and analysis efforts funded by the Chesapeake Bay Program Office, including Interagency Agreements shall have an associated Quality Assurance Project Plan approved by the Chesapeake Bay Program Office Quality Assurance Officer and the Project Officer. Specifically, the Quality Assurance Project Plan shall ensure that:

- The level of data quality needed will be determined and stated before the data collection effort begins; and

- All environmental data generated and processed will reflect the quality and integrity established by the Quality Assurance Project Plan.

The Quality Assurance Project Plan documents the technical and quality control aspects of the project such as data quality objectives, sampling design, sample collection, analytical methods, quality control limits and data management. In developing this plan, all efforts must be made to produce data that is comparable to data collected previously and currently by other Chesapeake Bay Program grant recipients and partners. All Quality Assurance Project Plans shall adhere to QA/R-5, *EPA Requirements for Quality Assurance Project Plans* (U.S. EPA 2001). Where possible, document control format as exhibited in this document should be utilized.

For all new environmental data related projects a draft quality assurance project plan for EPA review and approval is requested 30-60 days prior to the initiation of each data collection or data compilation activity. The originating Project Officer shall notify the Chesapeake Bay Program Office Quality Assurance Officer and the respective Goal Implementation Team Coordinator regarding the processing of the grant, interagency or formalized agreements during the planning phase. The Project Officer has responsibility for his/her project and is the official contact with the funding recipient. However, the Project Officer must obtain concurrence from the Chesapeake Bay Program Office Quality Assurance Officer on all matters affecting quality assurance.

Quality Assurance Project Plans shall be reviewed and approved prior to initiating environmental data operations, in the context of the project's objective(s) and data quality objectives. The Chesapeake Bay Program Office Quality Assurance Officer and Project Officer shall review and evaluate the use of these Plans during the environmental monitoring and assess the quality of the data generated and processed for Chesapeake Bay Program. Upon completion of the environmental data collection activities, the Project Officer shall also assess the actual performance of the planned activity and subsequent results according to the criteria described in the Quality Assurance Project Plans. Distribution lists of personnel who need to receive quality assurance reports and information are to be maintained as part of the Document Control System.

The Chesapeake Bay Program Office Quality Assurance Officer shall notify the Project Officer immediately of any problem areas identified in the review of the Quality Assurance Project Plan. Necessary changes will be jointly determined and the Project Officer will outline the corrective actions. A follow-up review of the required changes will be made by the Chesapeake Bay Program Office Quality Assurance Officer and Project Officer to verify that problems have been corrected. Project Officers shall review, comment on, and concur with the draft project report prior to the release of the final report.

If no changes are required to an existing quality assurance project plan, the grant recipient is required to provide written documentation (e.g., a letter) to the Project Officer stating that a review was conducted and no changes have occurred. The Chesapeake Bay Program Office Quality Assurance Officer and Project Officer must find the current Quality Assurance Project Plans for these activities acceptable prior to the approval of the grant, cooperative agreement or interagency agreement.

The Chesapeake Bay Program Office Quality Assurance Officer maintains electronic files of Quality Assurance Project Plans and Standard Operating Plans for all environmental data collections programs funded by the Chesapeake Bay Program Office and makes these documents directly accessible to data users through the Chesapeake Bay Program web site.

5 DOCUMENTATION AND RECORDS

5.1 DOCUMENTATION

Every data set served by Chesapeake Bay Program Office-funded data generators is accompanied by a related file documenting the source of the data, the contact for additional information, the sponsoring and collecting organizations, the reasons for collecting the data, published documents or reports associated with the data, and other items. Documentation on database files is essential for drawing meaningful interpretations of the data contained in the database. In addition, database management is dependent upon structured, easy-to-use documentation. See the "Documentation" section of the Chesapeake Information Management System website at http://archive.chesapeakebay.net/cims/ for a full description of each monitoring program's data. The Chesapeake Bay Program Data Center Manager ensures that these tasks are performed (See section 1.3.1).

Technical guidance and other quality-related documents are prepared by Workgroup members, peer reviewed and approved by the Scientific, Technical Analysis and Reporting Team (STAR), the Goal Implementation Team and/or Management Board. Once approved, guidance documents are given an EPA Document Control Number and filed electronically for future printings and revisions. The Administration Team is responsible for document control of all EPA and official Chesapeake Bay Program publications and reports. A listing of publications is maintained and hard copies kept on hand in a publication "library" at the Chesapeake Bay Program Office. For guidance documents, only the most recent versions are available for distribution. Documents and publications are also available on the Bay Program website

(http://www.chesapeakebay.net).

Documentation of data sources for publications available from the Chesapeake Bay Program website is achieved by requiring data sets, reports and publications to have associated metadata. For database documentation, database managers are responsible for documenting and discontinuing the use of obsolete and superseded procedures. Data management standard operating procedures (SOPs) are reviewed annually to ensure that procedural changes have been incorporated.

5.2 RECORDS

The Chesapeake Bay Program Office has adopted records management controls that are consistent with the U.S. EPA *Records Management Manual* (2160), i.e.., records are classified, retained and disposed according to the specifications in this Manual. Chesapeake Bay Program Office staff also must comply with the Project Officer's Manual requirements which states "Record retention requirements apply to all supporting documentation, including documentation of significant actions and decisions, cost records, scope of work, correspondence, applications, pre-award reviews, quality assurance plans (i.e. QAPP, QMP), and funding decisions.

The Chesapeake Bay Program Office keeps official records in-house for at least one year after the closeout of the agreement and then sends the records to the Federal Records Center where they are destroyed when they are ten years old. The retention time has been extended from seven to ten years in accordance with 31 U.S.C. 3731, the statute of limitations on civil false claims cases. If litigation, claim, negotiation, audit, or other action involving the records was started before the end of the retention period, the records must be kept until either the completion of the action and resolution of all issues which arise from it, or until the end of the established retention period, whichever is later.

The Chesapeake Bay Program Office Grants Coordinator located in the Communications and Administration Cluster has taken the on-line records management training and is familiar with records retention and management requirements. When needed, the Grants Coordinator coordinates with the Records Liaison Officer in the Philadelphia Regional Office (Region 3) to answer any questions staff may have pertaining to records management. Quality assurance documents, data reports and interpretive reports submitted for grants and assistance agreements are placed in the corresponding files and kept seven years after the date of last correspondence. Inactive files are placed in labeled cardboard boxes and stored in a locked room with limited access.

6 COMPUTER HARDWARE AND SOFTWARE

Chesapeake Bay Program Office funded data served through the Chesapeake Information Management System are managed through a variety of hardware or software and use standardized data management guidelines and policies to ensure consistency and comparability.

6.1 HARDWARE AND SOFTWARE DEVELOPMENT PROTOCOL

The Data Center development process is a user-driven, peer-reviewed process aimed at efficiently solving business problems. Solutions should involve team-based knowledge transfer, conform to Data Center and industry best practices, and utilize standards-based architecture and reusable logic. The process is not strictly iterative but rather is designed to be a guideline or best practice for application development that demands ongoing communication throughout the project life cycle.

The typical project lifecycle has nine phases: assessment, planning, design, prototyping, development, testing, documentation, deployment and maintenance. *Attachment 3, Data Center Project Planning Guide* describes each of the development phases.

6.2 DATA AND INFORMATION STANDARDS

The Chesapeake Bay Program has adopted data and information standards to improve coordination, compatibility, standardization, and access to data. Grantees, contractors, and data servers are required to submit deliverables in electronic format. Electronic deliverables include reports, graphics, spreadsheets, imagery, data files, audio, and digital video products. All data and information, whether funded directly or indirectly by EPA, is considered public information and may be made available to the public. Standards for submitting data and information are documented in Chesapeake Bay Program Guidance for Data Management (November 2006). The document describes the policies and guidelines for:

- Data, Information and Document Delivery
- Deliverable Serving vs. Submission
- Locational Data
- Map Coordinate Datum
- Map Coordinate Projection
- Metadata
- Common Station Names
- Common Data Dictionary
- Common Database Design

- Calendar Date
- Common Method Codes
- Data Reporting
- ITIS Biological Nomenclature

Specific guidelines for descriptive information, i.e., metadata, are documented in *Chesapeake Information Systems Metadata Reporting Guidelines* (September 1998) and available on the internet at http://archive.chesapeakebay.net/cims/metasep.pdf.

Chesapeake Bay database managers process data deliverables and identify deviations from reporting requirements. Database managers will contact the data generator directly to resolve minor errors; however, they consult with the appropriate Project Officer to resolve major reporting errors or omissions.

7 PLANNING FOR DATA ACQUISITIONS

The planning process for monitoring begins with program-wide objectives and priorities which are documented in a comprehensive monitoring strategy. In 2008, the Scientific and Technical Advisory Committee (STAC), in conjunction with Chesapeake Bay Program managers, developed a process for evaluating the objectives and priorities for water quality monitoring programs. The full report is available on the STAC website at: http://www.chesapeake.org/stac/Pubs/STACReviewPrioritiesFInal3-09.pdf .

The monitoring objectives and priorities for 2010 and beyond are conveyed from the Chesapeake Bay Management Board to the Scientific, Technical Analysis and Reporting (STAR) Team who recommends strategies and coordinates actions approved by the Management Board to accomplish management objectives.

Technical specifications for monitoring and data analysis are established by Chesapeake Bay Program workgroups, which consist of staff from EPA, state and federal agencies, academic institutions and non-profit organizations. For long-term projects, workgroups agree upon common objectives, designs, parameters, methods and quality assurance practices to ensure the consistency and comparability of data from multiple agencies and investigators.

Data from outside sources (i.e., secondary data) may be utilized following peer review and evaluation through the respective Chesapeake Bay Program workgroup. Hydrological, meteorological and agricultural data from USGS, NOAA and USDA are considered acceptable. Point-source and non-point source data generated by state and county agencies must have approved Quality Assurance Project Plans. Acceptance criteria for these secondary data sets are documented in the SOPs for point-source and non-point source data management.

Processes for the development and approval of Quality Management Plans and Quality Assurance Project Plans are described in Sections 2.2 and 4.4 above. Requirements for these plans are communicated to grantees and cooperative agreement holders via the Chesapeake Bay Program Office's annual grant guidance.

8 IMPLEMENTATION OF WORK PROCESSES

Work processes are monitored through a collaborative effort between the appropriate Chesapeake Bay Program Goal Implementation Team, Workgroup, and the Project Officer. Proposed projects are evaluated and approved through the Goal Implementation Teams and the Chesapeake Bay Program Management Board. Activities and outputs of the projects are presented to the respective Goal Implementation Team and Workgroup that actually use the information. Each of the projects is overseen by a Project Officer who is responsible for initiating the project, reviewing the progress reports, receiving applicable data and reports. Project Officers work in conjunction with the Goal Implementation Team and/or Workgroup to ensure that the project proceeds in the correct direction and generates the appropriate data and documents, in-line with the desired outcome. If a Project Officer, Goal Implementation Team, Workgroup or grantee decides to make changes to a project, the Project Officer documents the changes to the grant file and amends the grant if necessary.

Implementation of data collection operations is continually monitored. Monitoring data are submitted within 3-6 months of collection and pre-processed through automated data checks within 30 days. Annual data analysis and assessments provide further validation of the completeness of the data sets and the accuracy of the database.

9 ASSESSMENT AND RESPONSE

9.1 DATA QUALITY ASSESSMENTS

All routine water quality monitoring data generated through the Chesapeake Bay Program are submitted on a regular basis. For example, the State of Maryland and the Commonwealth of Virginia and their respective contractors are subjected to an Audit of Data Quality (ADQ). Before the Project Officer signs off on any particular data set submitted, monitoring data are run through a series of automated computer verification programs, called the Quality Assurance Tool (QAT). The QAT permits data submitters to upload both regular data submission and special submissions to add or replace data already in the CIMS Water Quality Database. After the data set is uploaded it is placed in a processing queue. During processing, a text report is created listing each of the over 150 quality assurance checks and the records that fail each check. These reports are reviewed and approved by the Chesapeake Bay Program Office Water Quality Data Manager before

a data set is imported to the water quality database and made available to the public.

9.2 TECHNICAL SYSTEMS AUDITS

Technical systems audits, which focus on the actual quality control in environmental measurement data collection systems, are performed at each laboratory and field data collection center involved the generation of data funded by the Chesapeake Bay Program Office. Technical systems audits are performed by the Chesapeake Bay Program Quality Assurance Coordinator who is experienced in water quality chemistry, data collection technology and quality control procedures. The audit addresses an examination of calibration records, sampling and measurement procedures, general laboratory conditions, support systems, equipment and facilities, maintenance and repair records, control charts, etc. Technical systems audits reports are submitted by the Chesapeake Bay Program Quality Assurance Coordinator to the Director of the audited laboratory and/or field operation with copies to the appropriate State Project Manager as well as to the respective Chesapeake Bay Program Goal Implementation Team/Workgroup Coordinator and Project Officer.

Reports of corrective action are to be submitted by each facility to the Chesapeake Bay Program Quality Assurance Coordinator within 45 days of receipt of the Technical systems audit report. Items not corrected will be brought to the attention of the funding recipient, Grants Manager, the Project Officer, the respective Chesapeake Bay Program Goal Implementation Team/Workgroup Coordinator and the Chesapeake Bay Program Office Quality Assurance Officer. The Project Officer has the authority to suspend or stop work in progress upon detection and identification of a situation affecting the quality of the results. In those cases, the Chesapeake Bay Program Office Director and Region 3 Grants and Audit Management Branch Chief are notified.

9.3 PERFORMANCE EVALUATIONS

On a semi-annual basis, blind audit samples are distributed to the laboratories participating in the Chesapeake Bay Mainstem, Tidal Tributary and Watershed Water Quality Monitoring Networks. An effort is made to adjust blind audit sample instructions to allow the analysis of concentration ranges appropriate to the respective monitoring program's ambient monitoring levels. Ampoules are prepared with deionized water as diluents since only a select set of laboratories analyze saline samples. For particulate parameters, suspended matter is collected on glass fiber filters.

Results are returned by the laboratories to the Chesapeake Bay Program Office Quality Assurance Coordinator for comparison with the current statistical estimates of the 95 and 99% confidence intervals. Audit sample performance is used along with

independent technical systems audits to evaluate each laboratory's capability to accurately analyze the parameters of interest.

9.4 PEER REVIEW

The performance and comparability of water quality monitoring methods is an ongoing activity of the Chesapeake Bay Program Analytical Methods and Quality Assurance Workgroup. This workgroup provides a technical peer review of data collection and reporting activities to ensure consistency. This group evaluates blind audit and coordinated split sample results and identifies procedural differences and recommends corrective actions to ensure inter-laboratory agreement. If corrective actions would affect the interpretation of subsequent data analyses, statistical analyses may be necessary to estimate the associated bias. All significant findings are reported to the appropriate Chesapeake Bay Program Goal Implementation Team/Workgroup, documented in the minutes of the Analytical Methods and Quality Assurance Workgroup meetings, and in the Data Analysis Issues Tracking System.

Modeling work done within the Chesapeake Bay Program Office is peer reviewed by the Chesapeake Bay Program Modeling Team every two months at in-depth, model review meetings. As discussed in Section 2.3.3 above, all Chesapeake Bay Program modeling activities, assumptions and related management applications are subject to scientific, independent external peer reviews. The Chesapeake Bay Program Scientific and Technical Advisory Committee organizes many of these *external* reviews of Chesapeake Bay Program Modeling Team products as well as peer reviews of monitoring and research activities.

9.5 MANAGEMENT ASSESSMENTS

As part of the annual Quality Management Plan review process, senior management will review and assess the adequacy of the quality system to meet the needs of the Chesapeake Bay Program Office and the larger Chesapeake Bay Program partnership. The Chesapeake Bay Program Office prepares a Quality Assurance Annual Report and Workplan (QAARWP) each year to be incorporated into the Region 3 QAARWP. Accomplishments and significant changes to the Chesapeake Bay Program Quality System are included in the QAARWP.

Every three years EPA OEI Quality Staff conduct a routine, independent Quality Systems Assessment of the Chesapeake Bay Program Office. This involves a review the components of the Chesapeake Bay Program Office Quality System to ensure that the Quality Management Plan is being implemented. The assessment and reported findings are done in conjunction with the OEI assessments of all Region 3 programs.

10 QUALITY IMPROVEMENT

All Chesapeake Bay Program Office staff is responsible for quality improvement within their areas. Chesapeake Bay Program Office senior managers communicate critical activities of the Chesapeake Bay Program at office-wide staff meetings and solicit input for improvements. The Associate Director for Science is responsible for the overall quality improvement program, the function of which is to identify the cause and consequence of a problem and suggest actions to prevent its recurrence. Chesapeake Bay Program Office senior managers and team leaders also use the Goal Implementation Teams and Workgroups to continually identify, plan, implement and evaluate the quality and effectiveness of the work of the Chesapeake Bay Program partnership.

11 REFERENCES

DOCUMENTS

1. Chesapeake Bay Program. September 2004. *Establishing a Chesapeake Bay Nontidal Watershed Water-Quality Network.* Prepared by the Chesapeake Bay Program Nontidal Water Quality Monitoring Workgroup. URL:http://archive.chesapeakebay.net/pubs/subcommittee/msc/ntwqwg/Nontidal_Monitoring_Report.pdf

2. Lane, Mark. 2004. *CIMS Data Upload and Quality Assurance Tool: Data User's Guide.* Prepared by Veridyne, Inc. for the U.S. EPA Region III Chesapeake Bay Program Office URL: http://archive.chesapeakebay.net/pubs/DUQATUsersGuide.pdf

3. U.S. EPA. August 1996. *Recommended Guidelines for Sampling and Analysis in the Chesapeake Bay Monitoring Program*. Chesapeake Bay Program, CBP/TRS 148/96; EPA 903-R-96-006. URL: http://www.chesapeakebay.net/content/publications/cbp_13101.pdf. Online revisions: http://www.chesapeakebay.net/committee_analyticalmethodsworkgroup_projects.aspx?menuitem=16701

4. U.S. Environmental Protection Agency (EPA). May 2000. EPA Order CIO 2105.0 - *Policy and Program Requirements for the Mandatory Agency-wide Quality System.* URL: http://www.epa.gov/irmpoli8/policies/21050.pdf

5. U.S EPA. March 2001. EPA *Requirements for Quality Management Plans* (QA/R-2) EPA/240/B-01/002. URL: http://www.epa.gov/quality1/qs-docs/r2-final.pdf .

6. U.S. EPA. March 2001. *EPA Requirements for Quality Assurance Project Plans* (QA/R-5) EPA/240/B-01/003. URL: http://www.epa.gov/quality1/qs-docs/r5-final.pdf

7. U.S. EPA Records Management Manual (2160)
URL:http://www.epa.gov/records/policy/manual/index.htm

8. U.S. EPA Project Officer Manual, 6th edition. November, 2005.
URL: http://intranet.epa.gov/ogd/project_officer_manual6/7closeout.htm

9. Chesapeake Bay Program. 2008. Chesapeake Action Plan (CAP) Reporting Guidance for the CAP Application Reporting System Version 1.0. March 17, 2008
URL: http://cap.chesapeakebay.net/docs/CAP%20Reporting%20Guidance.pdf

WEBSITES

1. Chesapeake Executive Council
URL: http://www.chesapeakebay.net/committee_ec_info.aspx?menuitem=46324

2. Chesapeake Bay Program Quality Assurance Program
URL: http://www.chesapeakebay.net/qualityassurance.aspx?menuitem=16659

3. Chesapeake Bay Program Office Grants URLs:
http://www.epa.gov/region03/chesapeake/grants.htm

4. Chesapeake Bay Program Analytical Methods and Quality Assurance Workgroup
URL:http://www.chesapeakebay.net/committee_analyticalmethodsworkgroup_projects.aspx?menuitem=16701

5. Chesapeake Bay Program Modeling Team - Publications and Current Projects
http://www.chesapeakebay.net/committee_msc_info.aspx

6. Submerged Aquatic Vegetation in Chesapeake Bay
http://web.vims.edu/bio/sav/index.html

7. Chesapeake Bay Program Data Hub
http://www.chesapeakebay.net/dataandtools.aspx?menuitem=14872

8. Chesapeake Bay Program Water Quality Database
http://www.chesapeakebay.net/data_waterquality.aspx

9. Chesapeake Bay Program Nontidal Workgroup - Current Projects and Information
http://www.chesapeakebay.net/committee_nontidalworkgroup_projects.aspx?menuitem=16724

10. Data Analysis Issues Tracking System (DAITS)
http://archive.chesapeakebay.net/pubs/DAITS_9_21_10.pdf

11. Chesapeake Bay Program Indicators Workgroup – Current Projects and Information
http://www.chesapeakebay.net/committee_indicatorsworkgroup_projects.aspx?menuitem=16719

12. Chesapeake Bay Program's Scientific and Technical Advisory Committee
http://www.chesapeake.org/stac/stacinfo

Attachment 1 Chesapeake Bay Program Office Organizational Products and Services Covered by the Office's Quality System	
Category	**Products / Services**
Assessments	
Data Quality	Quality Assurance Tool (automated verification of data) Technical System Audits Laboratory Performance Testing and Evaluation QAPP Review and Approval
Scientific	Chesapeake Bay Health and Restoration Indicators Resource Lands Assessment
	Chesapeake Bay Water Quality Standards Assessments
Management	*Annual Health and Restoration Assessment of the Chesapeake Bay Watershed* ChesapeakeStat (http://stat.chesapeakebay.net) CBPO QA Annual Report & Work Plan (QAARWP) National Academy of Sciences Independent Evaluator
Data	
Environmental	Tidal Water Quality and Biological Monitoring Data Watershed Surface Water Quality and Stream Flow Monitoring Data Watershed Model Scenario Databases (Point and Nonpoint Source BMP data) Land Cover and GIS Data
Management	Chesapeake Registry (Partnership activity and funding database)
Administrative	CBPO Grants Tracking System (CATS)
Grants / Contracts / Interagency Agreements	
Administrative	Review and Approval of Responses to Solicitations QA Review and Documentation
Policy and Guidance Documents	
Programmatic	CBPO Quality Management Plan
	CBP Guidelines for Water Quality Sampling and Analysis
	Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity & Chlorophyll a for Chesapeake Bay & Its Tidal Tributaries (2003,2004,2007, 2008, 2010)
	Chesapeake Bay Program Guidance for Data Management (11/2006); CIMS Metadata Reporting Guidelines (9/1998)
	CBPO Data Management SOPs
Administrative	*Reporting Guidance for the Chesapeake Action Plan/Activity Integration Plan (CAP/AIP) Reporting System*
	U.S. EPA Chesapeake Bay Program Office Grant Guidance

Attachment 1 (con't.) Chesapeake Bay Program Office Organizational Products and Services Covered by the Office's Quality System	
Category	**Products / Services**
Information Management and Technologies	
Programmatic	Chesapeake Information Management System (CIMS) Chesapeake Bay Program Website (www.chesapeakebay.net) ChesapeakeStat Chesapeake Action Plan (re-named to Bay Tracking and Accountability System)
Modeling and Other Decision-Support Tools	
Scientific	Chesapeake Bay Phase 5 Watershed Model Chesapeake Bay Water Quality and Sediment Transport Model
	Chesapeake Bay Land Change Model
	Chesapeake Bay Water Quality Criteria Assessment Tool
	Resource Lands Assessment
	GIS Analysis and Mapping http://www.chesapeakebay.net/content/publications/cbp_33365.pdf)
Reports	
Progress, Performance and Characterization Reports	*Strengthening the Management, Coordination, and Accountability of the Chesapeake Bay Program - Report to Congress* (July 2008) *Bay Barometer: A Health and Restoration Assessment of the Chesapeake Bay and Watershed in 2008* (CBP/TRS 293-09 EPA-903-R-09-001 March 2009)
Research (includes Peer Review)	
Scientific Review	Scientific and Technical Advisory Committee (STAC) reviews and recommendations

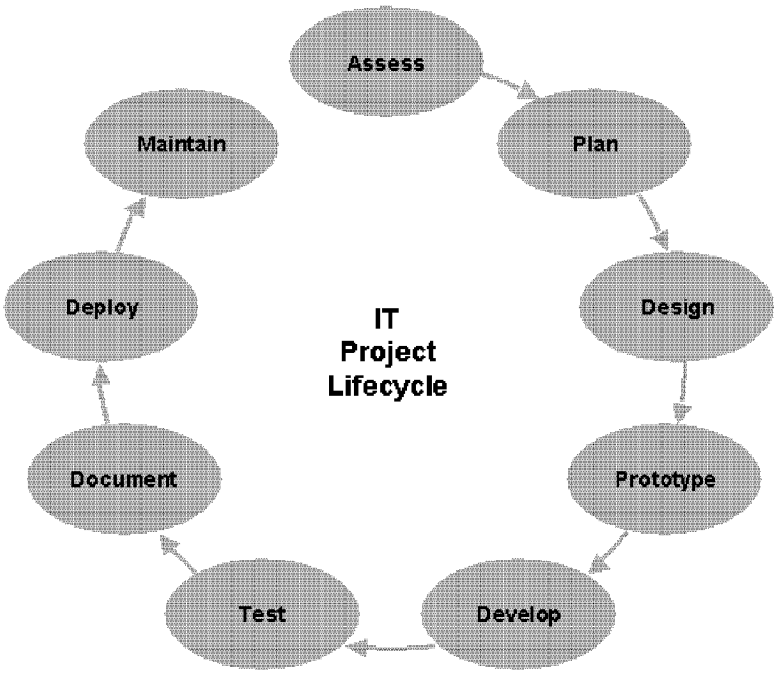
Attachment 2: Crosswalk of the Quality Assurance Responsibilities Held by Federal Employees within the EPA Chesapeake Bay Program Office		
EPA Chesapeake Bay Program Office Quality Assurance Officer	**Federal Chesapeake Bay Program Quality Assurance Coordinator**	**EPA/Federal Chesapeake Bay Program Project Officers**
Drafts, approves and signs all quality assurance policies and the EPA Chesapeake Bay Program Office's QMP.		Provide technical input on draft policy and management oriented quality assurance documents.
Reviews technical comments and recommendations; provides final EPA approval of and signs all quality assurance project plans.	Reviews federal assistance agreements and determines quality requirements; reviews quality assurance project plans; prepares technical comments and makes recommendations on the adequacy of the plans to achieve the project objectives; coordinates the resolution of deficiencies with project officers.	Review draft quality assurance project plans; formally transmit technical comments to assistance agreement recipients; ensure recipients respond to all technical comments; sign approved quality assurance project plans.
Approves on-site audit plans and priorities for technical assessments; reviews technical assessment findings; determines necessary response actions; assigns responsibility for follow up to response actions.	Conducts on-site technical assessments of field, laboratory and data handling operations; prepares technical comments and recommends necessary response actions in accordance with established technical assessment procedures.	Formally transmit technical on-site field, laboratory, data and information management audit comments to assistance agreement recipients; ensure that recipients respond to all technical comments received.
Approves plans and procedures for implementing the split sampling program; reviews split sample assessment findings; determines response and corrective actions; assigns responsibility for follow up to response actions.	Coordinates the multi-laboratory tidal and nontidal coordinated split sample programs; responsible for analysis and interpretation of the results; monitors individual laboratory performance; prepares recommendations for corrective actions or quality improvement.	Formally transmit any technical issues and/or requests for response to results from the coordinated split sample programs to assistance agreement recipients; ensure that recipients respond to all technical comments received.

Attachment 2: Crosswalk of the Quality Assurance Responsibilities Held by Federal Employees within the EPA Chesapeake Bay Program Office		
EPA Chesapeake Bay Program Office Quality Assurance Officer	**Federal Chesapeake Bay Program Quality Assurance Coordinator**	**EPA/Federal Chesapeake Bay Program Project Officers**
Approves plans and procedures for implementing the water quality laboratory blind reference material audit program; reviews recommendations from blind reference audits; assigns responsibility for follow up to response actions.	Coordinates the blind reference material audit program; ensure adequacy of program to assess laboratory performance; monitors individual laboratory performance, prepares recommendations for corrective actions and quality improvement resulting from blind reference material program.	Formally transmit any technical issues and/or requests for response to results from the blind reference audit program to assistance agreement recipients; ensure assistance agreement recipients respond to all technical comments received.
Reviews recommendations from the Chesapeake Bay Program Analytical Methods and Quality Assurance Workgroup; determines necessary response actions; assigns responsibility for follow up to response actions.	Works through the Chesapeake Bay Program Analytical Methods and Quality Assurance Workgroup to identify data quality problems associated with field sampling techniques and analytical methods and develops recommendations.	Formally transmit any technical issues and/or requests for response to issues raised by the Chesapeake Bay Program Analytical Methods and Quality Assurance Workgroup to assistance agreement recipients; ensure assistance agreement recipients respond to all technical comments received.
Reviews recommendations from the Chesapeake Bay Program Office Data Center staff; determines necessary response actions; assigns responsibility for follow up to response actions.	Works with the Chesapeake Bay Program Data Managers to document methods and quality control data; ensures that data reporting requirements are documented in quality assurance project plans; support data managers on documentation decisions.	Formally transmit any technical issues and/or requests for response to issues raised by the Chesapeake Bay Program Office Data Center staff to assistance agreement recipients; ensure assistance agreement recipients respond to all technical comments.
Reviews recommendations from the Goal Implementation Teams and Workgroups; determines necessary response actions; assigns responsibility for follow up to response actions.	Works with the Chesapeake Bay Program's Goal Implementation Teams and Workgroups to identify quality assurance related issues identified during the analysis and interpretation of environmental data.	Formally transmit any technical issues and/or requests for response to issues raised by the Goal Implementation Teams to assistance agreement recipients; ensure that recipients respond to all technical comments.

Attachment 3: Data Center Project Planning Guide

Background:
The Data Center development process is a user-driven, peer-reviewed process aimed at efficiently solving business problems. Solutions should involve team-based knowledge transfer, conform to Data Center and industry best practices, and utilize standards-based architecture and reusable logic. The process is not strictly iterative but rather is designed to be a guideline or best practice for application development that demands ongoing communication throughout the project life cycle.

Project Lifecycle:
The typical project lifecycle has nine phases: assessment, planning, design, prototyping, development, testing, documentation, deployment and maintenance.



Project Planning:
Attachment 5-A, *Project Planning Flowchart*, contains a detailed view of work flow and approval process for the Daa Center. Attachment 5-B, *Project Planning Checklist,* contains a checklist to serve as a guide for Data Center projects.

Assess:
The project assessment phase involves analyzing client requirements in order to construct a technology-and-solution-free problem statement. A well-defined problem facilitates the development of the best solution. The outcome of the assessment phase is a requirements document containing a problem statement, user assessment and detailed solution deliverable dates. The requirements document is to be reviewed by the Data Center Manager, the CBPO Communications Team and other key staff to ensure the project fits within the Data Center and Communication goals.

Plan:
The project planning phase builds on the assessment phase to include an overview of what the solution is likely to involve, metrics that will demonstrate the problem has been solved, software and hardware needs and a rough schedule and key personnel for the project. The outcome of the planning phase is a solution overview document and meeting to detail the schedule, metrics, key personnel and key users of the proposed system. The meeting should include representation from both the technical solution developers and the users of the system.

Design:
The design phase often contains 3 parts: a paper prototype of the interface, a design document for the data, and a design document for the application logic. The paper prototype is paper representation of the user interface. The objective is to evaluate the effectiveness of the proposed design by working through a usability evaluation with members of the user community. The Web Team is responsible for ensuring the paper prototype and usability evaluations follow the Data Center best practices.

The design document for the data should contain an entity-relationship diagram to identify existing and planned data elements and structures, as well as relationships between entities and elements. The Data Team is responsible for reviewing the data design.

The design document for logic should include use case diagrams and detail existing and planned reusable logic classes using a static structure diagram. The Application Team is responsible for the review of the logic design document.

Prototype:
The prototype phase is for creating an electronic version of the paper prototype. It goes beyond the design phase in that code is written to demonstrate the most likely look and feel of an application. The necessity of this step is guided by the users' interest in seeing an application shell prior to intensive development. Focus is on the presentation layer of the application, the 'usableness' of the application and the identification of test criteria.

Develop:
Building on the previous phases, the development phase is the physical construction of the solution. This includes developing the required data elements, structures and relationships; developing the user interface; and constructing the logic that drives the solution. The outcome of the development phase is a fully functional solution operating in a development environment.

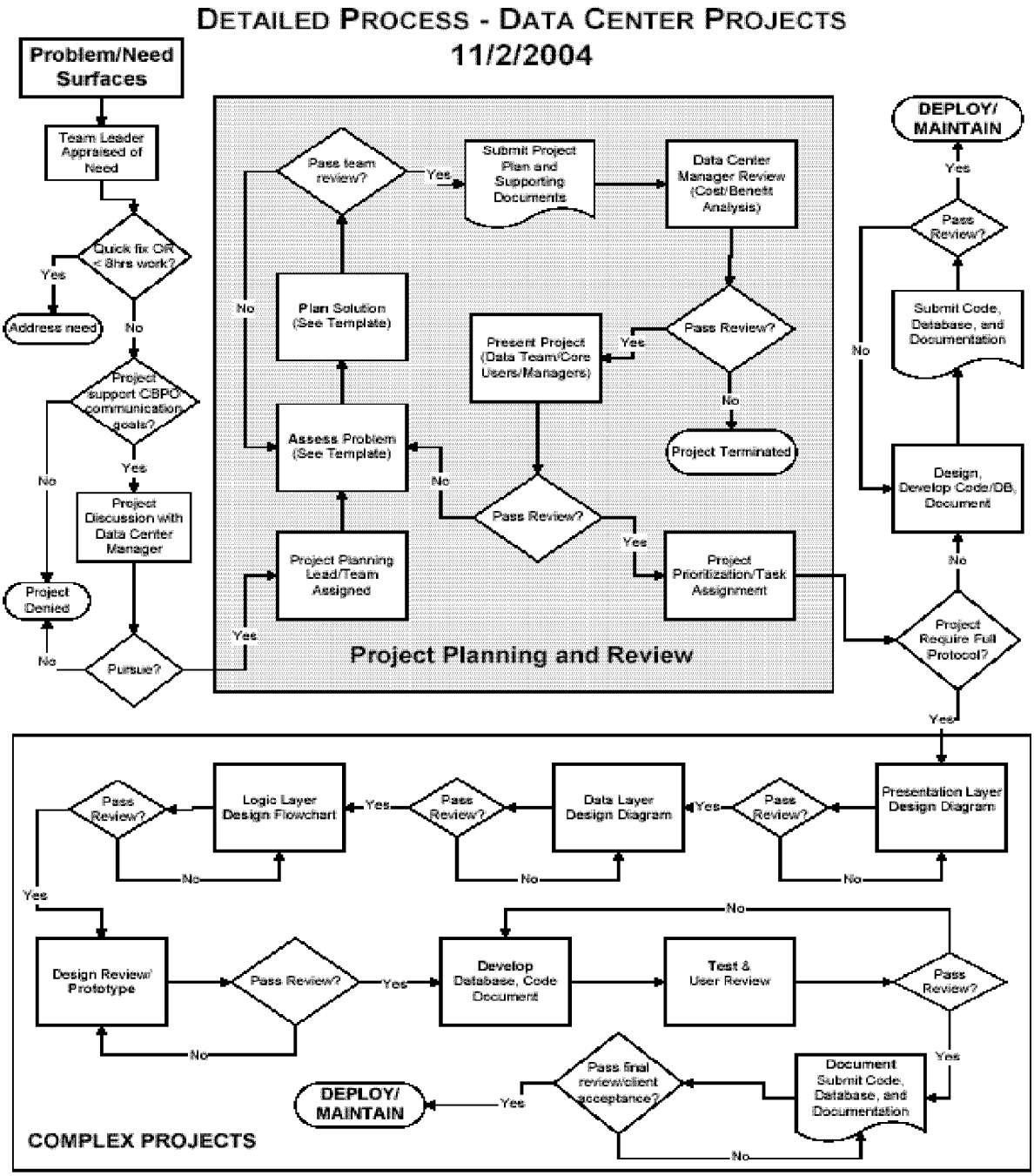
Test:
In this phase Data Center developers and critical users are afforded the opportunity to test the application in the development environment. Errors in the application are systematically noted and corrected. Additionally, solution performance under a variety of load conditions is evaluated and corrected as necessary.

Document:
Ideally application and database documentation is written during development and best practices are employed so that code and data elements are as descriptive as possible. Documentation, whenever possible, is included with code and in databases. User documentation may also be a requirement which is finalized as well in this phase. The outcome of the documentation phase is a fully functional, user tested application that contains documentation for the data, logic and interface.

Deploy:
Prior to deployment, a meeting should be held that presents the application for a final review where the separate teams have an opportunity to discuss the application and the issues brought up during developing, testing, reviewing, and documenting the application. Following this pre-deployment meeting, the application is deployed from the development environment to the production environment in accordance with the deployment plan created in the Develop phase.

Maintain:
A maintenance plan is created that consists of scheduled maintenance, versioning plan, responsibility matrix. The project lead should also make note of lessons learned in the project.

Attachment 3A



Attachment 3B: IT Project Planning Checklist

CBPO Data Center			8/26/2004
Project Planning Checklist			
Project Name: _____			
☑	n/a	**Task**	**Completion Date**
		1. Assess	
☐	☐	a. Provide necessary background information	
☐	☐	b. Conduct *Client Interview* (see Client Questionnairre)	
☐	☐	c. Develop solution-free problem statement	
☐	☐	c. Create *Requirements Analysis* document (See Template)	
☐	☐	d. Data Center Manager approval to continue work	
		2. Plan	
☐	☐	a. Identify architectural dependencies/requirements	
☐	☐	b. Identify/justify roles, resources, technologies	
☐	☐	c. Develop success metrics	
☐	☐	d. Create *Solution Overview* document (see Template)	
☐	☐	e. Present solution to appropriate users, developers, managers	
☐	☐	f. Data Center approval	
		3. Design	
☐	☐	a. Develop data layer design diagram	
☐	☐	b. Data Team approval of data layer design	
☐	☐	c. Logic layer design diagram	
☐	☐	d. Application Team approval of logic layer design	
☐	☐	e. Develop presentation layer design diagram	
☐	☐	f. Web Team approval	
		4. Prototype	
☐	☐	a. Develop prototype	
☐	☐	b. Develop test criteria/ performance metrics	
☐	☐	c. Review with client and audience representative(s)	
		5. Develop	
☐	☐	a. Data/database development	
☐	☐	b. Logic development	
☐	☐	c. Presentation development	
☐	☐	d. Document	
		6. Test	
☐	☐	a. Performance metrics met/exceeded	
☐	☐	b. Client and audience needs met/exceeded	
		7. Document	
☐	☐	a. Data Team approval of data layer documentation	
☐	☐	b. Application Team approval of logic layer documentation	
☐	☐	c. Web Team approval of presentation documentation	
☐	☐	d. Data Center final approval	
		8. Deploy	
☐	☐	a. Resource location: _____	
☐	☐	b. Documentation location: _____	
		9. Maintain	
☐	☐	a. Develop maintenance plan/agreement with client/audience representatives	
☐	☐	b. Success metrics met/exceeded	
☐	☐	c. Final client approval	

Attachment 4

Chesapeake Bay Program Indicator Framework
Reporting Level Indicators
Indicator and Data Survey

For each indicator for which you are responsible, please provide the following information. This information will be made available to the developers of the reports, the reviewers of the reports and by members of the public who may request detailed information about the data used in the reports. Please refer to the sample for examples of the level of detail that should be provided.

A. Category/Name/Source/Contact

(1) Category of Indicator
___ Factors Impacting Bay and Watershed Health
___ Restoration and Protection Efforts
___ Watershed Health
___ Bay Health

(2) Name of Indicator:

(3) Data Set Description:

- For what purpose(s) were the data collected? (e.g., tracking, research, or long-term monitoring.)
- Which parameters were measured directly? Which were obtained by calculation?

(4) Source(s) of Data:

- Is the complete data set accessible, including metadata, data-dictionaries and embedded definitions? If yes, please indicate where complete dataset can be obtained.

(5) Custodian of Source Data (and Indicator, if different):

(6) CBPO Contact:

B. Communication Questions (complete either part 1, 2, or 3)

1. Restoration and Protection Efforts indicators only

(7a) How much has been completed since 1985 (or baseline year)? How much has been completed since 2000?

(8a) How much was done last year?

(9a) What is the current status in relation to a goal?

(10a) What is the key story told by this indicator?

(11a) Why is it important to report this information?

(12a) What detail and/or diagnostic indicators are related to this reporting level indicator? (Detail and diagnostic indicators can be spatially-specific, parameter-specific, temporally-specific information, etc.)

2. Bay Health or Watershed Health indicators only

(7b) What is the long-term trend? (since start of data collection)

(8b) What is the short-term trend? (3 to 5 year trend)

(9b) What is the current status in relation to a goal?

(10b) What is the key story told by this indicator?

(11b) Why is it important to report this information?

(12b) What detail and/or diagnostic indicators are related to this reporting level indicator?

3. Factors Impacting Bay and Watershed Health indicators only

(7c) What is the long-term trend? (since start of data collection)

(8c) What is the short-term trend? (3 to 5 year trend)

(9c) What is the current status?

(10c) What is the key story told by this indicator?

(11c) Why is it important to report this information?

(12c) What detail and/or diagnostic indicators are related to this reporting level indicator?

C. Temporal Considerations

(13) Data Collection Date(s):

(14) Planned Update Frequency (e.g. - annual, bi-annual):
(a) Source Data:
(b) Indicator:

(15) For annual reporting, month spatial data is available for reporting:

D. Spatial Considerations

(16) Type of Geography of Source Data (point, line polygon, other):

(17) Acceptable Level of Spatial Aggregation (e.g. - county, state, major basin, tributary basin, HUC):

(18) Are there geographic areas with missing data? If so, where?

(19) The spatial extent of this indicator best described as:
(a) Chesapeake Bay (estuary)
(b) Chesapeake Bay Watershed
(c) Other (please describe): _____

Please submit any appropriate examples of how this information has been mapped or otherwise portrayed geographically in the past.

(20) Can appropriate diagnostic indicators be represented geographically?

E. Data Analysis and Interpretation: (Please provide appropriate references and location of documentation if hard to find.)

(21) Is the conceptual model used to transform these measurements into an indicator widely accepted as a scientifically sound representation of the phenomenon it indicates? (i.e., how well do the data represent the phenomenon?)

(22) What is the process by which the raw data is summarized for development and presentation of the indicator?

(23) Are any tools required to generate the indicator data (e.g. - Interpolator, watershed model)

(24) *Are the computations* widely accepted as a scientifically sound?

(25) Have appropriate statistical methods been used to generalize or portray data beyond the time or spatial locations where measurements were made (e.g., statistical survey inference, no generalization is possible)?

(26) Are there established reference points, thresholds or ranges of values for this indicator that unambiguously reflect the desired state of the environment? (health/stressors only)

F. Data Quality: (Please provide appropriate references and location of documentation if hard to find.)

(27) Were the data collected according to an EPA-approved Quality Assurance Plan?
If no, complete questions 28a – 28d:

(28a) Are the sampling design, monitoring plan and/or tracking system used to collect the data over time and space based on sound scientific principles?

(28b) What documentation clearly and completely describes the underlying sampling and analytical procedures used?

(28c) Are the sampling and analytical procedures widely accepted as scientifically and technically valid?

(28d) To what extent are the procedures for quality assurance and quality control of the data documented and accessible?

(29) Are the descriptions of the study or survey design clear, complete and sufficient to enable the study or survey to be reproduced?

(30) Were the sampling and analysis methods performed consistently throughout the data record?

(31) If datasets from two or more agencies are merged, are their sampling designs and methods comparable?

(32) Are uncertainty measurements or estimates available for the indicator and/or the underlying data set?

(33) (Do the uncertainty and variability impact the conclusions that can be inferred from the data and the utility of the indicator?

(34) Are there noteworthy limitations or gaps in the data record? Please explain.

G. Additional Information (optional)

(35) Please provide any other information about this indicator you believe is necessary to aid communication and any prevent potential miss-representation.